

JAPANESE

[JP,11-069457,A]

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CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE  
INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

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**CLAIMS**

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**[Claim(s)]**

[Claim 1] One or more mobile stations which perform two or more base transceiver stations and them which were connected to the network, and radio, Connect with a network and it consists of a processor which processes information with directions of a mobile station. In the system which transmits a control signal for a base transceiver station to notify that it is among [ which can be communicated / area ] the base transceiver station to a mobile station continuously or intermittently with the identifier of the base transceiver station In case a mobile station directs processing, it notifies the identifier of the mobile station to the processor. The information about assignment of a base transceiver station that the result which the mobile station processed to directions of the processing to said processor is transmitted is included. A processor transmits a processing result to the base transceiver station specified by the mobile station with the identifier of a mobile station. The processing result transmitted in the specified base transceiver station is memorized with the identifier of a mobile station to storage. Said control signal with which a base transceiver station transmits it when it moves to the location in which the base transceiver station and radio which were specified are possible detects said mobile station. It notifies that the mobile station went into the base transceiver station in the area which can communicate with the identifier of the mobile station. The radio channel for transmitting the processing result immediately between the base transceiver station and mobile station, when the processing result is accumulated in the base station is established. The mobile communication information-transmission approach characterized by transmitting a processing result to a mobile station from a base transceiver station using the established radio channel.

[Claim 2] When there is a base transceiver station which can communicate in order to receive a message, a mobile station It notifies for whenever [ of migration in the migration management database which manages the location of the mobile station by which the purport which is within the circle / of the base transceiver station / was connected to the base transceiver station in the network as a base transceiver station which transmits the result of having processed the base transceiver station / every ]. In a database, memorize the positional information and a processor asks the migration management database the positional information of the mobile station which carried out the directions when processing was completed. A processor is the mobile communication information-transmission approach according to claim 1 characterized by what the identifier of a processing result and its mobile station is transmitted for to the base transceiver station where a mobile station can communicate from the inquiry result.

[Claim 3] In case the information about assignment of a base transceiver station that the processed result is transmitted directs processing to a processor, they are a migration proposed route and its migration means. A processor predicts the location of a mobile station from the elapsed time from the migration proposed route previously notified when processing finished, and its notice. The mobile communication information-transmission approach according to claim 1 characterized by what said processing result is transmitted for to the base transceiver station where the location where it is expected that the mobile station passes in the prediction location after near and its time of day serves as within the circle with the identifier of the mobile station.

[Claim 4] The mobile communication information-transmission approach according to claim 3

characterized by what a processor precedes predicting the location of a mobile station from the elapsed time from the migration proposed route notified previously and its notice when processing finishes, it asks the database which manages a traffic situation traffic information, and predicts the location of a mobile station for from the traffic information and proposed route.

[Claim 5] A processor in the base transceiver station which saves a processing result even after transmitting to the base transceiver station which should transmit a processing result, and is accumulating the processing result Measure the elapsed time after accumulating a processing result, and when it goes through the time amount as which the measurement result was determined beforehand, the are recording information is canceled. A processor is the mobile communication information-transmission approach of any one publication of claim 1-4 characterized by what a processing result is transmitted for to the base transceiver station shown by the positional information of the mobile station shown [ in / notify the canceled purport to a processor, reset the above-mentioned elapsed time, and / the time amount ] by claims 1-4.

[Claim 6] Said processing result other than the base transceiver station where existence of the base transceiver station specified by a mobile station or its mobile station is predicted is transmitted also to the surrounding base transceiver station of the base transceiver station with the identifier of the mobile station. The elapsed time after receiving in the base transceiver station which is receiving and accumulating the identifier of the processing result and mobile station is measured. The mobile communication information-transmission approach of any one publication of claim 1-5 characterized by what the accumulated processing result is canceled for when a processing result is not received without going into within the circle [ which was defined beforehand / to which the mobile station can communicate with the base transceiver station ], even if it carries out fixed time amount progress.

[Claim 7] When a mobile station moves to the outside of the circle from within the circle [ which can communicate with the base transceiver station ] while having received the processing result from the base transceiver station Notify that to a processor and a processor transmits a processing result to the surrounding base transceiver station of the base transceiver station to which the notice has been sent. It is the mobile communication information-transmission approach of any one publication of claim 1-6 which accumulates the processing result in the base transceiver station which received it, and is characterized by what a mobile station receives all processing results for again from the base transceiver station which entered within the circle next.

[Claim 8] When a mobile station moves to the outside of the circle from within the circle [ which can communicate with the base transceiver station ] while having received the processing result from the base transceiver station Notify to a processor how far that and a processing result were transmitted, and a processor transmits the processing result whose mobile station is not received to the surrounding base transceiver station of the base transceiver station to which the notice has been sent. It is the mobile communication information-transmission approach according to claim 7 which the mobile station accumulates a non-received processing result in the base transceiver station which received it, and is characterized by what a mobile station receives the processing result of the part which is not received [ the base transceiver station which entered within the circle next to ] for.

[Claim 9] The mobile communication information-transmission approach of any one publication of claim 1-8 characterized by what the message are recording database which accumulates the message addressed to the mobile station temporarily is connected to the network when a mobile station is outside [ which can be communicated / area ] all base transceiver stations, and it precedes transmitting a processing result to a base transceiver station, and the message addressed to the mobile station is taken out from the message are recording database, and it transmits to the base transceiver station, and is accumulated with a processing result.

[Claim 10] The mobile communication information-transmission approach of any one publication of claim 1-9 characterized by resending the data which were mistaken only in the section when the error was detected when error detection was performed and an error was detected, in order to guarantee information being mistaken and being transmitted in the section which transmits a

processing result to a base transceiver station from a processor, and the section transmitted to a mobile station from a base transceiver station that there is nothing.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

**[Field of the Invention]** In mobile communication, since a wireless circuit changes unstably and violently, this invention relates to the system which transmits for a short time, when the wireless circuit is stable in required data.

**[0002]**

**[Description of the Prior Art]** Until now, the communication line might be cut by the time mobile communication waited for the result in the communication link which requires time amount after starting communication links, such as retrieval of a database, count using data, and processing, before being able to obtain a required result, since the condition of a wireless circuit changed violently and could not maintain a stable communication link with migration of a mobile station. In order to compensate the fault of this unstable wireless circuit, directions of the contents of processing were requested to the processor, after fixed time amount progress, after it asked the processor that result from the mobile station or processing finished [ the processor ], that mobile station was called, the circuit was established, and the processing result was transmitted to that mobile station.

**[0003]** However, the mobile station which requests processing requests processing to a processor through a base transceiver station 1 as an example also by this approach to be shown in drawing 12 R> 2. If a mobile station goes into the area of a base transceiver station 2 and performs a series of processings from location registration, a linkup (circuit establishment), and processing result transmission to link disconnection after it processes with a processor and processing finishes Where the link of "a mobile station and a base transceiver station 2" is established, the link of "a base transceiver station 2 and a processor" was also established, and moreover, in order to go across and transmit a processing result to these two links, the transmission section was set to two and it had taken time amount.

**[0004]**

**[Problem(s) to be Solved by the Invention]** Although the method of the circuit of a mobile station and a base transceiver station being hardly stable, cutting a wireless circuit during processing as shown in the conventional technique, and establishing a wireless circuit again after processing had been taken, when a wireless circuit was established, even if it was able to communicate by being stabilized, the wireless circuit might have become unstable while transmitting data from the processor. Moreover, even if it called the mobile station from the processor after processing termination, even if it did not restrict that a mobile station was not necessarily in within the circle [ of a certain base transceiver station ] and was within the circle, while transmitting the processing result to the mobile station from the processor, the problem that a wireless circuit might be cut was. When the area which a base transceiver station covers especially is not continuing, since possibility of moving to the area where a mobile station cannot communicate during a communication link becomes high, this problem becomes remarkable.

**[0005]** Then, the purpose of this invention is in such mobile communication to offer the approach of transmitting a processing result to a mobile station certainly and efficiently.

**[0006]**

[Means for Solving the Problem] As shown in drawing 1 , the processing result to receive is accumulated in the previous base transceiver station where the mobile station moved. By doing in this way, shortly after a mobile station goes into the base transceiver station and the area where a communication link is possible, the processing result is receivable. For example, when moving to the Shin-Oosaka station from the Tokyo station with the Shinkansen, and processing is directed before the Tokyo station departure by the base transceiver station (AP-1) course at the upper left of [ this ] drawing and it stops at intermediate Nagoya, the processing result accumulated in the base transceiver station at the lower left of [ this ] drawing (AP-2) is received. It is technically difficult only for an economic target to make all the routes of the Shinkansen into the area which can radiocommunicate. The communication link with the mobile which this is moving at high speed is because fluctuation of the propagation path under communication link is very sharp. Then, like this example, when it stops at the Nagoya station, it becomes possible to receive, since the processing result is accumulated in the base transceiver station even if that stoppage time is a short time. If there is little amount of data of a processing result, it is also possible to store data to the Odawara station in the middle of reducing speed at the time of passage etc. In addition, processing can be directed in the service area in the middle of moving by vehicle in Tomei Expressway, and a processing result can also be received in a previous service area. Thus, if the place which becomes within the circle [ of a certain base transceiver station ] is also a short time even if the area which can perform radio is discontinuous, the processing result of it is receivable by giving directions of required processing.

[0007] As the flow of an actual signal is shown in drawing 2 , processing is directed to a processor by base station AP-1 during migration (1). A processor is (2)/which searches all the data that search or are connected to the database in the LAN etc. by the Internet if needed when it calculates or LAN is connected to it according to the request (3). When those the required processings of all are completed, it is moving, or a previous mobile station transmits the processing result to base transceiver station AP-2 which move, and accumulates it (4). By doing in this way, a processing result can be certainly transmitted now to a mobile station.

[0008] Moreover, since a processing result is generally data, a transmission error is not permitted. Then, error resending control is performed and an error free-lancer is compensated. In this case, it generates mostly by the wireless circuit and an error is hardly generated in the network using a cable. Moreover, a propagation delay has the description that a section of wire line with a long distance becomes dominant. For this reason, if error resending control is performed between a processor and a mobile station, the propagation delay between those both is long, and since there is a wireless circuit, an error will increase. For this reason, in this invention, efficient error control can be performed by dividing error resending control into the two sections of "a processor, a base transceiver station", and "a base transceiver station and a mobile station", and performing it. Below, the detailed technical-problem solution means for every claim is shown.

[0009] The processor transmits the processing result to the specified base transceiver station by specifying the base transceiver station where the mobile station transmits and accumulates the processing result, and when a mobile station goes into the area which the base transceiver station covers, the processing result can be received immediately. Since a mobile station does not need to establish the circuit to a processor when receiving a processing result (linkup), many data (processing result) are receivable in a short time. It is effective especially when the time amount which processing takes is clear (claim 1).

[0010] Moreover, after processing finishes with a processor, the location of a mobile station is asked to a migration management database, a processing result is transmitted to the base station, it can accumulate temporarily and a processing result can be certainly transmitted to a mobile station by transmitting data to the mobile station immediately in a short time (claim 2). Since a mobile station may move to the outside of the circle of the base transceiver station while transmitting a processing result to a base transceiver station from a processor, however, in a processor Even after transmitting a processing result to a base transceiver station, the processing result is accumulated. When the base transceiver station is not able to transmit a

processing result to a mobile station, that is notified to a processor and a processor transmits a processing result to the base transceiver station of the migration place of a mobile station again, transmission of a processing result is made more reliable (claim 5).

[0011] Moreover, when required processing ends a processor from the notified migration schedule by notifying the schedule which a mobile station moves to a processor, it is transmitting and accumulating a processing result to the base station where it is predicted a communication link becoming possible, and even if time amount required for processing at a processor is indefinite, a processing result can be certainly transmitted to a mobile station in a short time (claims 3 and 4).

[0012] Moreover, since a communication link may not be able to do a mobile station over a long time when the area which a base transceiver station covers is discontinuity, the message is accumulated to the message are recording database which accumulates the message addressed to a mobile station, a processor precedes transmitting a processing result to a base transceiver station, the existence of the message is checked, in a certain case, the message is taken out, and it transmits to a base transceiver station with a processing result (claim 9).

[0013] As mentioned above, by forestalling to a suitable base transceiver station and transmitting a processing result to a mobile station to it, since transmission of a processing result is performed by the circuit between a base transceiver station and a mobile station and even a processor does not need to establish a circuit, the time amount which has established the wireless circuit with an unstable mobile station can be shortened sharply, and can receive a required processing result certainly.

[0014] Furthermore, in consideration of a cell finishing or turning off the power, or moving to the outside of the circle of the base transceiver station, even if it transmits a processing result to the base transceiver station in which a mobile station must be present and has not carried out location registration to the area of other base transceiver stations, the are recording information which became unnecessary in the base transceiver station is canceled (claim 6).

[0015] Moreover, as soon as a mobile station goes into within the circle [ of one base station of the circumference ] by transmitting a processing result to the base transceiver station around the base transceiver station where the mobile station was communicating till then on that occasion since it might come out to the outside of the circle still with migration on the way, although the transmission time of a processing result could be sharply shortened by this invention, it enables it to receive a processing result immediately (claims 7 and 8).

[0016]

[Embodiment of the Invention] The first example of this invention 1 is shown in drawing 3 . It gets to know that a mobile station has the base transceiver station which covers the location which is at the time from the control signal which a base transceiver station transmits. The identifier of the base transceiver station which covers that is contained in this control signal, and a mobile station can identify that base transceiver station. This uses for judging whether it is the base transceiver station where the mobile station can communicate correctly.

[0017] The mobile station which got to know that the base transceiver station which covers the location in which a mobile station is present was a base transceiver station 1 establishes a wireless circuit to the base transceiver station 1, and transmits a processing request to a base transceiver station with the identifier of a mobile station. Furthermore, a base transceiver station transmits the processing request to a processor. In a processor, processing according to the request is performed, the circuit to the base transceiver station 2 planned from the migration schedule which consists of information on a location over a certain time amount notified when processing was completed and processing of a mobile station was directed when a mobile station is or moves to immediately after [ at the time ] at the time is established, and a processing result is transmitted. The base transceiver station 2 which received the processing result accumulates the processing result, and a mobile station goes into within the circle [ of the base transceiver station ], gets to know having transmitted the location registration signal from the identifier of a mobile station, and transmits immediately the processing result which established the wireless circuit and was accumulated to a mobile station after receiving the location registration signal. A migration schedule here becomes effective especially, when the probability

of migration schedules, such as an electric car which a mobile station takes, is high. Since a communication link is stabilized at the time of a stop by transmitting a processing result to base transceiver stations, such as a station which the electric car stops next, after processing finishes, as for a mobile station, a processing result is certainly receivable.

[0018] The first example of this invention 2 is shown in drawing 4. A wireless circuit is established to the base transceiver station 1 which covers the location in which a mobile station is present, and a processing request is transmitted to a base transceiver station. Furthermore, a base transceiver station transmits the processing request to a processor. In a processor, processing according to the request is performed, when processing is completed, the positional information of the mobile station registered to the migration management database is asked, a circuit is established to the base transceiver station 3 shown in the positional information, and a processing result is transmitted. The base station which received the processing result calls a mobile station immediately, and transmits a processing result to a mobile station. Although a mobile station is in within the circle [ of a base transceiver station 2 ] at once in the example here, since processing does not finish while being in within the circle [ the ], a processing result is unreceivable there. Then, while being in within the circle [ of a base transceiver station 3 ], processing has received the end processing result.

[0019] The first example of this invention 3 is shown in drawing 5. A wireless circuit is established to the base transceiver station 1 which covers the location in which a mobile station is present, and if it is the means of migration and a route, and electric cars, such as on foot, an automobile, and an electric car, as a processing request and a migration schedule, such information will be transmitted to a base transceiver station 1 by making the route into a migration proposed route. Furthermore, a base transceiver station 1 transmits the processing request and migration schedule to a processor. In a processor, when processing according to the request is performed and processing is completed, a processing result is transmitted to the base transceiver station 2 where it is planned from the migration schedule notified from the mobile station that a mobile station is in the time amount which the processing finished, or a mobile station moves to it soon. If the signal of location registration is sent from a mobile station, immediately, a base transceiver station 2 will establish a circuit and will transmit a processing result to a mobile station.

[0020] The first example of this inventions 4 and 9 is shown in drawing 6. A wireless circuit is established to the base transceiver station 1 which covers the location in which a mobile station is present, and a processing request and a migration schedule are transmitted to a base transceiver station. Furthermore, a base transceiver station 1 transmits the processing request and migration schedule to a processor. In a processor, when processing according to the request is performed and processing is completed, the migration schedule notified from the mobile station is corrected from traffic information, and a processing result is transmitted to the base transceiver station 2 where it is predicted that a mobile station is or a mobile station moves soon at the time. This prediction is performed by the migration management database. A migration management database predicts the location at the time of there being an inquiry of the location of a mobile station from a processor based on the migration schedule notified from the mobile station using the traffic information about the means of transportation which a mobile station uses. This traffic information predicts a migration location based on the operation situation of a railroad, when a mobile station is caused on a railroad using road traffic information in migration by the vehicle. If the signal of location registration is sent from a mobile station, immediately, a base transceiver station 2 will establish a circuit and will transmit a processing result to a mobile station.

[0021] Moreover, when a mobile station is outside the area which can communicate with a base transceiver station (outside of the circle), by accumulating the message from the others, the communication link with the others can be mediated and improvement in communicative convenience can be aimed at. The message are recording database in this drawing realizes this function. Although he wants to communicate with a mobile station, since a mobile station is the outside of the circle, if it is in the condition whose communication link is impossible, it will leave a message to this message are recording database. Before transmitting a processing result to a



base transceiver station 2 from a processor, the existence of the message addressed to the mobile station is checked to a message recording database, and, in a certain case, it transmits with a processing result to it.

[0022] The first example of this invention 5 is shown in drawing 7. Processing is completed, ask a migration management database the location of the mobile station in the time, and the processing result to the predicted base transceiver station 2 in delivery and the base transceiver station 2 which is accumulating it. Since this prediction was not correctly performed by the reason of the migration schedule having changed, When a certain corresponding mobile station does not go into within the circle [ of the base transceiver station 2 ] and cannot transmit a processing result to a mobile station even if it carries out fixed time amount progress after starting are recording in a base transceiver station 2. While discarding the processing result accumulated in the base transceiver station 2, that is notified to a processor from a base transceiver station 2, and the location in which an applicable mobile station is present again is asked to a migration management database, and a processor does it again, and transmits a processing result to the base transceiver station 3. In a processor, after transmitting a processing result to a base transceiver station 3, if a base transceiver station 3 to the notice of processing result abandonment cannot be found into the time amount defined beforehand, it will consider that the accumulated processing result was transmitted to the mobile station, and a processing result will be discarded. Thereby, useless are recording with a processor is avoidable.

[0023] The first example of this invention 6 is shown in drawing 8. Processing is completed and a processing result is transmitted to the base transceiver stations 1-3 considered that a mobile station is at the time of day. The base station and base transceiver stations 2 and 3 which are predicted that a mobile station is in a base transceiver station 1 here from the migration schedule notified from the mobile station at the time are base transceiver stations which adjoin or it touches a base transceiver station 1. In each base transceiver station, the received processing result is accumulated and the storage time is measured. When the storage time goes through fixed time amount, the accumulated processing result is canceled. In this example, the mobile station went into within the circle [ of a base transceiver station 2 ], and has received the processing result from the base transceiver station 2. Other base transceiver stations 1 and 3 will cancel an are recording processing result, if the time amount currently measured by the timer expires. Moreover, in a base transceiver station 2, a processing result is canceled, after transmitting a processing result to a mobile station. Thus, even if the migration schedule which the mobile station notified to assignment or a processor changes somewhat, a processing result is receivable even from a surrounding base transceiver station.

[0024] The first example of this invention 7 is shown in drawing 9. Processing is completed and a processing result is transmitted to the base transceiver station 1 considered that a mobile station is at the time of day. The received processing result is accumulated in a base transceiver station 1. In this example, the mobile station went into within the circle [ of a base transceiver station 1 ], and has received the processing result from the base transceiver station 1. the processing result is transmitted — on the way — since it came out, it has moved to the outside of the circle of a base transceiver station 1 and transmission is not completed — a base transceiver station 1 — a processor — transmission the non-completed notice of a purport — it carries out. In a processor, in response to the notice, other base transceiver stations 2 are predicted that a mobile station moves, and a processing result is transmitted to a base transceiver station 2. A mobile station receives an entering processing result to within the circle [ of a base transceiver station 2 ]. Here, since a part of all processing results received previously are canceled, a processing result is rereceived from the beginning, and management of a transmission situation will be in two conditions of "un-completing" and "completion", management of the processing result in a processor and a mobile station becomes easy.

[0025] The first example of this invention 8 is shown in drawing 10. Processing is completed and a processing result is transmitted to the base transceiver station 1 considered that a mobile station is at the time of day. The received processing result is accumulated in a base transceiver station 1. In this example, the mobile station went into within the circle [ of a base transceiver station 1 ], and has received the processing result from the base transceiver station 2. Since the

mobile station has moved to the outside of the circle of a base transceiver station 1 while transmitting the processing result, transmission has not been completed. Then, it notifies how far transmission of a processing result completed the base transceiver station 1 to the processor. In a processor, in response to the notice, it predicts that a mobile station moves to the area of a base transceiver station 2 from a migration schedule, and the processing result of the part whose transmission to a mobile station is not completed is transmitted to a base transceiver station 2. A mobile station receives an entering processing result to within the circle [ of a base transceiver station 2 ]. Here, since the processing result received previously is memorized as it is, it is not necessary to resend it and the processing results remaining in a short time can be transmitted. Although the surrounding base transceiver station of a base transceiver station 1 is the example of only a base transceiver station 2 in this example, if the processing result of a transmission a non-completed part is transmitted to all the base transceiver station of them and a mobile station goes into within the circle [ of those base transceiver stations / one ] when there are more than one, the remaining processing results are receivable.

[0026] The count result for checking the effectiveness of this invention to drawing 11 is shown. Here, it computed the ratio of the non-completion ratio of processing result transmission which changes according to the difference of the processing result transmission time in the conventional technique and this invention by the probability to hold the circuit having decreased with the exponential function, and having assumed that control of location registration, a linkup, etc. took 0.1 seconds, respectively, so that the connect time of a wireless circuit was long. Although the effectiveness of this invention is so large that the transmission time of a processing result is short, even if processing result transmission takes 20 seconds, it turns out that the non-completion ratio is improved about 37%.

[0027] In addition, in evaluation here, it was assumed that the transmission time of a processing result was the same in a cable network and a wireless circuit.

[0028]

[Effect of the Invention] Since a required processing result is receivable in the connect time of a short wireless circuit applying this invention to the system by which a circuit is again established between a mobile station and a processor, and a mobile station obtains a processing result as compared with the conventional technique after it requests from a processor the processing which time amount requires in the system which performs a mobile radio communication link and processing finishes, as explained above, the result of the purpose can obtain certainly efficiently. Moreover, error control (resending control) can also be efficiently performed to coincidence.

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**TECHNICAL FIELD**

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[Field of the Invention] In mobile communication, since a wireless circuit changes unstably and violently, this invention relates to the system which transmits for a short time, when the wireless circuit is stable in required data.

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**PRIOR ART**

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[Description of the Prior Art] Until now, the communication line might be cut by the time mobile communication waited for the result in the communication link which requires time amount after starting communication links, such as retrieval of a database, count using data, and processing, before being able to obtain a required result, since the condition of a wireless circuit changed violently and could not maintain a stable communication link with migration of a mobile station. In order to compensate the fault of this unstable wireless circuit, directions of the contents of processing were requested to the processor, after fixed time amount progress, after it asked the processor that result from the mobile station or processing finished [ the processor ], that mobile station was called, the circuit was established, and the processing result was transmitted to that mobile station.

[0003] However, the mobile station which requests processing requests processing to a processor through a base transceiver station 1 as an example also by this approach to be shown in drawing 12 R> 2. If a mobile station goes into the area of a base transceiver station 2 and performs a series of processings from location registration, a linkup (circuit establishment), and processing result transmission to link disconnection after it processes with a processor and processing finishes Where the link of "a mobile station and a base transceiver station 2" is established, the link of "a base transceiver station 2 and a processor" was also established, and moreover, in order to go across and transmit a processing result to these two links, the transmission section was set to two and it had taken time amount.

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**EFFECT OF THE INVENTION**

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[Effect of the Invention] Since a required processing result is receivable in the connect time of a short wireless circuit applying this invention to the system by which a circuit is again established between a mobile station and a processor, and a mobile station obtains a processing result as compared with the conventional technique after it requests from a processor the processing which time amount requires in the system which performs a mobile radio communication link and processing finishes, as explained above, the result of the purpose can obtain certainly efficiently. Moreover, error control (resending control) can also be efficiently performed to coincidence.

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] Although the method of the circuit of a mobile station and a base transceiver station being hardly stable, cutting a wireless circuit during processing as shown in the conventional technique, and establishing a wireless circuit again after processing had been taken, when a wireless circuit was established, even if it was able to communicate by being stabilized, the wireless circuit might have become unstable while transmitting data from the processor. Moreover, even if it called the mobile station from the processor after processing termination, even if it did not restrict that a mobile station was not necessarily in within the circle [ of a certain base transceiver station ] and was within the circle, while transmitting the processing result to the mobile station from the processor, the problem that a wireless circuit might be cut was. When the area which a base transceiver station covers especially is not continuing, since possibility of moving to the area where a mobile station cannot communicate during a communication link becomes high, this problem becomes remarkable.

[0005] Then, the purpose of this invention is in such mobile communication to offer the approach of transmitting a processing result to a mobile station certainly and efficiently.

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**MEANS**

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[Means for Solving the Problem] As shown in drawing 1 , the processing result to receive is accumulated in the previous base transceiver station where the mobile station moved. By doing in this way, shortly after a mobile station goes into the base transceiver station and the area where a communication link is possible, the processing result is receivable. For example, when moving to the Shin-Osaka station from the Tokyo station with the Shinkansen, and processing is directed before the Tokyo station departure by the base transceiver station (AP-1) course at the upper left of [ this ] drawing and it stops at intermediate Nagoya, the processing result accumulated in the base transceiver station at the lower left of [ this ] drawing (AP-2) is received. It is technically difficult only for an economic target to make all the routes of the Shinkansen into the area which can radiocommunicate. The communication link with the mobile which this is moving at high speed is because fluctuation of the propagation path under communication link is very sharp. Then, like this example, when it stops at the Nagoya station, it becomes possible to receive, since the processing result is accumulated in the base transceiver station even if that stoppage time is a short time. If there is little amount of data of a processing result, it is also possible to store data to the Odawara station in the middle of reducing speed at the time of passage etc. In addition, processing can be directed in the service area in the middle of moving by vehicle in Tomei Expressway, and a processing result can also be received in a previous service area. Thus, if the place which becomes within the circle [ of a certain base transceiver station ] is also a short time even if the area which can perform radio is discontinuous, the processing result of it is receivable by giving directions of required processing.

[0007] As the flow of an actual signal is shown in drawing 2 , processing is directed to a processor by base station AP-1 during migration (1). A processor is (2)/which searches all the data that search or are connected to the database in the LAN etc. by the Internet if needed when it calculates or LAN is connected to it according to the request (3). When those the required processings of all are completed, it is moving, or a previous mobile station transmits the processing result to base transceiver station AP-2 which move, and accumulates it (4). By doing in this way, a processing result can be certainly transmitted now to a mobile station.

[0008] Moreover, since a processing result is generally data, a transmission error is not permitted. Then, error resending control is performed and an error free-lancer is compensated. In this case, it generates mostly by the wireless circuit and an error is hardly generated in the network using a cable. Moreover, a propagation delay has the description that a section of wire line with a long distance becomes dominant. For this reason, if error resending control is performed between a processor and a mobile station, the propagation delay between those both is long, and since there is a wireless circuit, an error will increase. For this reason, in this invention, efficient error control can be performed by dividing error resending control into the two sections of "a processor, a base transceiver station", and "a base transceiver station and a mobile station", and performing it. Below, the detailed technical-problem solution means for every claim is shown.

[0009] The processor transmits the processing result to the specified base transceiver station by specifying the base transceiver station where the mobile station transmits and accumulates

the processing result, and when a mobile station goes into the area which the base transceiver station covers, the processing result can be received immediately. Since a mobile station does not need to establish the circuit to a processor when receiving a processing result (linkup), many data (processing result) are receivable in a short time. It is effective especially when the time amount which processing takes is clear (claim 1).

[0010] Moreover, after processing finishes with a processor, the location of a mobile station is asked to a migration management database, a processing result is transmitted to the base station, it can accumulate temporarily and a processing result can be certainly transmitted to a mobile station by transmitting data to the mobile station immediately in a short time (claim 2). Since a mobile station may move to the outside of the circle of the base transceiver station while transmitting a processing result to a base transceiver station from a processor, however, in a processor Even after transmitting a processing result to a base transceiver station, the processing result is accumulated. When the base transceiver station is not able to transmit a processing result to a mobile station, that is notified to a processor and a processor transmits a processing result to the base transceiver station of the migration place of a mobile station again, transmission of a processing result is made more reliable (claim 5).

[0011] Moreover, when required processing ends a processor from the notified migration schedule by notifying the schedule which a mobile station moves to a processor, it is transmitting and accumulating a processing result to the base station where it is predicted a communication link becoming possible, and even if time amount required for processing at a processor is indefinite, a processing result can be certainly transmitted to a mobile station in a short time (claims 3 and 4).

[0012] Moreover, since a communication link may not be able to do a mobile station over a long time when the area which a base transceiver station covers is discontinuity, the message is accumulated to the message are recording database which accumulates the message addressed to a mobile station, a processor precedes transmitting a processing result to a base transceiver station, the existence of the message is checked, in a certain case, the message is taken out, and it transmits to a base transceiver station with a processing result (claim 9).

[0013] As mentioned above, by forestalling to a suitable base transceiver station and transmitting a processing result to a mobile station to it, since transmission of a processing result is performed by the circuit between a base transceiver station and a mobile station and even a processor does not need to establish a circuit, the time amount which has established the wireless circuit with an unstable mobile station can be shortened sharply, and can receive a required processing result certainly.

[0014] Furthermore, in consideration of a cell finishing or turning off the power, or moving to the outside of the circle of the base transceiver station, even if it transmits a processing result to the base transceiver station in which a mobile station must be present and has not carried out location registration to the area of other base transceiver stations, the are recording information which became unnecessary in the base transceiver station is canceled (claim 6).

[0015] Moreover, as soon as a mobile station goes into within the circle [ of one base station of the circumference ] by transmitting a processing result to the base transceiver station around the base transceiver station where the mobile station was communicating till then on that occasion since it might come out to the outside of the circle still with migration on the way, although the transmission time of a processing result could be sharply shortened by this invention, it enables it to receive a processing result immediately (claims 7 and 8).

[0016]

[Embodiment of the Invention] The first example of this invention 1 is shown in drawing 3 . It gets to know that a mobile station has the base transceiver station which covers the location which is at the time from the control signal which a base transceiver station transmits. The identifier of the base transceiver station which covers that is contained in this control signal, and a mobile station can identify that base transceiver station. This uses for judging whether it is the base transceiver station where the mobile station can communicate correctly.

[0017] The mobile station which got to know that the base transceiver station which covers the location in which a mobile station is present was a base transceiver station 1 establishes a



wireless circuit to the base transceiver station 1, and transmits a processing request to a base transceiver station with the identifier of a mobile station. Furthermore, a base transceiver station transmits the processing request to a processor. In a processor, processing according to the request is performed, the circuit to the base transceiver station 2 planned from the migration schedule which consists of information on a location over a certain time amount notified when processing was completed and processing of a mobile station was directed when a mobile station is or moves to immediately after [ at the time ] at the time is established, and a processing result is transmitted. The base transceiver station 2 which received the processing result accumulates the processing result, and a mobile station goes into within the circle [ of the base transceiver station ], gets to know having transmitted the location registration signal from the identifier of a mobile station, and transmits immediately the processing result which established the wireless circuit and was accumulated to a mobile station after receiving the location registration signal. A migration schedule here becomes effective especially, when the probability of migration schedules, such as an electric car which a mobile station takes, is high. Since a communication link is stabilized at the time of a stop by transmitting a processing result to base transceiver stations, such as a station which the electric car stops next, after processing finishes, as for a mobile station, a processing result is certainly receivable.

[0018] The first example of this invention 2 is shown in drawing 4 . A wireless circuit is established to the base transceiver station 1 which covers the location in which a mobile station is present, and a processing request is transmitted to a base transceiver station. Furthermore, a base transceiver station transmits the processing request to a processor. In a processor, processing according to the request is performed, when processing is completed, the positional information of the mobile station registered to the migration management database is asked, a circuit is established to the base transceiver station 3 shown in the positional information, and a processing result is transmitted. The base station which received the processing result calls a mobile station immediately, and transmits a processing result to a mobile station. Although a mobile station is in within the circle [ of a base transceiver station 2 ] at once in the example here, since processing does not finish while being in within the circle [ the ], a processing result is unreceivable there. Then, while being in within the circle [ of a base transceiver station 3 ], processing has received the end processing result.

[0019] The first example of this invention 3 is shown in drawing 5 . A wireless circuit is established to the base transceiver station 1 which covers the location in which a mobile station is present, and if it is the means of migration and a route, and electric cars, such as on foot, an automobile, and an electric car, as a processing request and a migration schedule, such information will be transmitted to a base transceiver station 1 by making the route into a migration proposed route. Furthermore, a base transceiver station 1 transmits the processing request and migration schedule to a processor. In a processor, when processing according to the request is performed and processing is completed, a processing result is transmitted to the base transceiver station 2 where it is planned from the migration schedule notified from the mobile station that a mobile station is in the time amount which the processing finished, or a mobile station moves to it soon. If the signal of location registration is sent from a mobile station, immediately, a base transceiver station 2 will establish a circuit and will transmit a processing result to a mobile station.

[0020] The first example of this inventions 4 and 9 is shown in drawing 6 . A wireless circuit is established to the base transceiver station 1 which covers the location in which a mobile station is present, and a processing request and a migration schedule are transmitted to a base transceiver station. Furthermore, a base transceiver station 1 transmits the processing request and migration schedule to a processor. In a processor, when processing according to the request is performed and processing is completed, the migration schedule notified from the mobile station is corrected from traffic information, and a processing result is transmitted to the base transceiver station 2 where it is predicted that a mobile station is or a mobile station moves soon at the time. This prediction is performed by the migration management database. A migration management database predicts the location at the time of there being an inquiry of the location of a mobile station from a processor based on the migration schedule notified from the

mobile station using the traffic information about the means of transportation which a mobile station uses. This traffic information predicts a migration location based on the operation situation of a railroad, when a mobile station is caused on a railroad using road traffic information in migration by the vehicle. If the signal of location registration is sent from a mobile station, immediately, a base transceiver station 2 will establish a circuit and will transmit a processing result to a mobile station.

[0021] Moreover, when a mobile station is outside the area which can communicate with a base transceiver station (outside of the circle), by accumulating the message from the others, the communication link with the others can be mediated and improvement in communicative convenience can be aimed at. The message are recording database in this drawing realizes this function. Although he wants to communicate with a mobile station, since a mobile station is the outside of the circle, if it is in the condition whose communication link is impossible, it will leave a message to this message are recording database. Before transmitting a processing result to a base transceiver station 2 from a processor, the existence of the message addressed to the mobile station is checked to a message are recording database, and, in a certain case, it transmits with a processing result to it.

[0022] The first example of this invention 5 is shown in drawing 7. Processing is completed, ask a migration management database the location of the mobile station in the time, and the processing result to the predicted base transceiver station 2 in delivery and the base transceiver station 2 which is accumulating it. Since this prediction was not correctly performed by the reason of the migration schedule having changed, When a certain corresponding mobile station does not go into within the circle [ of the base transceiver station 2 ] and cannot transmit a processing result to a mobile station even if it carries out fixed time amount progress after starting are recording in a base transceiver station 2. While discarding the processing result accumulated in the base transceiver station 2, that is notified to a processor from a base transceiver station 2, and the location in which an applicable mobile station is present again is asked to a migration management database, and a processor does it again, and transmits a processing result to the base transceiver station 3. In a processor, after transmitting a processing result to a base transceiver station 3, if a base transceiver station 3 to the notice of processing result abandonment cannot be found into the time amount defined beforehand, it will consider that the accumulated processing result was transmitted to the mobile station, and a processing result will be discarded. Thereby, useless are recording with a processor is avoidable.

[0023] The first example of this invention 6 is shown in drawing 8. Processing is completed and a processing result is transmitted to the base transceiver stations 1-3 considered that a mobile station is at the time of day. The base station and base transceiver stations 2 and 3 which are predicted that a mobile station is in a base transceiver station 1 here from the migration schedule notified from the mobile station at the time are base transceiver stations which adjoin or it touches a base transceiver station 1. In each base transceiver station, the received processing result is accumulated and the storage time is measured. When the storage time goes through fixed time amount, the accumulated processing result is canceled. In this example, the mobile station went into within the circle [ of a base transceiver station 2 ], and has received the processing result from the base transceiver station 2. Other base transceiver stations 1 and 3 will cancel an are recording processing result, if the time amount currently measured by the timer expires. Moreover, in a base transceiver station 2, a processing result is canceled, after transmitting a processing result to a mobile station. Thus, even if the migration schedule which the mobile station notified to assignment or a processor changes somewhat, a processing result is receivable even from a surrounding base transceiver station.

[0024] The first example of this invention 7 is shown in drawing 9. Processing is completed and a processing result is transmitted to the base transceiver station 1 considered that a mobile station is at the time of day. The received processing result is accumulated in a base transceiver station 1. In this example, the mobile station went into within the circle [ of a base transceiver station 1 ], and has received the processing result from the base transceiver station 1. the processing result is transmitted — on the way — since it came out, it has moved to the outside of the circle of a base transceiver station 1 and transmission is not completed — a base

transceiver station 1 — a processor — transmission the non-completed notice of a purport — it carries out. In a processor, in response to the notice, other base transceiver stations 2 are predicted that a mobile station moves, and a processing result is transmitted to a base transceiver station 2. A mobile station receives an entering processing result to within the circle [ of a base transceiver station 2 ]. Here, since a part of all processing results received previously are canceled, a processing result is rereceived from the beginning, and management of a transmission situation will be in two conditions of "un-completing" and "completion", management of the processing result in a processor and a mobile station becomes easy.

[0025] The first example of this invention 8 is shown in drawing 10. Processing is completed and a processing result is transmitted to the base transceiver station 1 considered that a mobile station is at the time of day. The received processing result is accumulated in a base transceiver station 1. In this example, the mobile station went into within the circle [ of a base transceiver station 1 ], and has received the processing result from the base transceiver station 2. Since the mobile station has moved to the outside of the circle of a base transceiver station 1 while transmitting the processing result, transmission has not been completed. Then, it notifies how far transmission of a processing result completed the base transceiver station 1 to the processor. In a processor, in response to the notice, it predicts that a mobile station moves to the area of a base transceiver station 2 from a migration schedule, and the processing result of the part whose transmission to a mobile station is not completed is transmitted to a base transceiver station 2. A mobile station receives an entering processing result to within the circle [ of a base transceiver station 2 ]. Here, since the processing result received previously is memorized as it is, it is not necessary to resend it and the processing results remaining in a short time can be transmitted. Although the surrounding base transceiver station of a base transceiver station 1 is the example of only a base transceiver station 2 in this example, if the processing result of a transmission a non-completed part is transmitted to all the base transceiver station of them and a mobile station goes into within the circle [ of those base transceiver stations / one ] when there are more than one, the remaining processing results are receivable.

[0026] The count result for checking the effectiveness of this invention to drawing 11 is shown. Here, it computed the ratio of the non-completion ratio of processing result transmission which changes according to the difference of the processing result transmission time in the conventional technique and this invention by the probability to hold the circuit having decreased with the exponential function, and having assumed that control of location registration, a linkup, etc. took 0.1 seconds, respectively, so that the connect time of a wireless circuit was long. Although the effectiveness of this invention is so large that the transmission time of a processing result is short, even if processing result transmission takes 20 seconds, it turns out that the non-completion ratio is improved about 37%.

[0027] In addition, in evaluation here, it was assumed that the transmission time of a processing result was the same in a cable network and a wireless circuit.

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[Translation done.]

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1] It is drawing which explains a fundamental idea to be the background of this invention.

[Drawing 2] The base station where the mobile station belongs when AP-1 directs processing in drawing explaining the flow of the signal in this invention, and AP-2 are base stations where the mobile station belongs, when receiving a processing result.

[Drawing 3] It is the first example of this invention 1.

[Drawing 4] It is the first example of this invention 2.

[Drawing 5] It is the first example of this invention 3.

[Drawing 6] It is the first example of this inventions 4 and 6.

[Drawing 7] It is the first example of this invention 5.

[Drawing 8] It is the first example of this invention 7.

[Drawing 9] It is the first example of this invention 8.

[Drawing 10] It is the first example of this invention 9.

[Drawing 11] It is drawing explaining the effectiveness of this invention.

[Drawing 12] It is drawing explaining the conventional technique.

[Description of Notations]

AP-1, AP-2 Base transceiver station

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[Translation done.]

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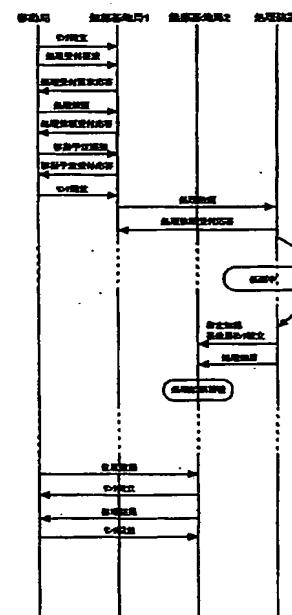
(54) 【発明の名称】 移動通信情報伝送方法

(57) 【要約】

【課題】 移動通信において、処理装置による処理結果を確実に効率よく移動局に伝送する。

【解決手段】 移動局は処理の指示に際し、その移動局の識別子と処理結果を伝送する無線基地局の指定を行い、処理結果はその無線基地局に記憶しておき、移動局がその無線基地局のエリアに入ったときに処理結果を移動局に伝送する。

本発明1の第一実施例



## 【特許請求の範囲】

【請求項 1】 ネットワークに接続された複数の無線基地局及びそれらと無線通信を行う 1 つ以上の移動局、ネットワークに接続され、移動局の指示により情報の処理を行う処理装置からなり、無線基地局は移動局へその無線基地局の通信可能エリア内であることを通知するための制御信号の送信をその無線基地局の識別子と共に連続的或いは間欠的に行うシステムにおいて、

移動局は処理の指示を行う際にその移動局の識別子の通知をその処理装置へ行い、移動局が前記処理装置に対する処理の指示に処理した結果を伝送する無線基地局の指定に関する情報を含め、処理装置は処理結果を移動局により指定された無線基地局へ移動局の識別子と共に伝送し、指定された無線基地局では伝送されてきた処理結果を記憶装置へ移動局の識別子と共に記憶し、前記移動局は指定した無線基地局と無線通信が可能な場所へ移動したときにそれを無線基地局が送信する前記制御信号により検出し、

その移動局はその無線基地局へ通信が可能なエリアに入ったことをその移動局の識別子と共に通知し、その基地局で処理結果が蓄積されている場合にはその無線基地局と移動局との間で直ちにその処理結果を伝送するための無線チャネルを確立し、処理結果をその確立した無線チャネルを用いて無線基地局から移動局へ伝送することを特徴とする、移動通信情報伝送方法。

【請求項 2】 移動局は着信を行うために通信可能な無線基地局がある場合には、その無線基地局を処理した結果を伝送する無線基地局として、その無線基地局へその無線基地局の圏内である旨をネットワークに接続された移動局の位置を管理する移動管理データベースへ移動の度毎に通知し、

データベースではその位置情報を記憶し、処理装置は処理が終了した時点でその指示をした移動局の位置情報をその移動管理データベースへ問い合わせ、処理装置はその問い合わせ結果から移動局が通信可能な無線基地局へ処理結果とその移動局の識別子を伝送する、

ことを特徴とする請求項 1 記載の移動通信情報伝送方法。

【請求項 3】 処理した結果を伝送する無線基地局の指定に関する情報が処理の指示を処理装置へ行う際に移動予定経路とその移動手段であり、処理装置は処理が終わった際に先に通知された移動予定経路とその通知からの経過時間から移動局の位置を予測し、

その予測位置に近かつその時刻以降にその移動局が通過することが予想される場所が圏内となる無線基地局へ前記処理結果をその移動局の識別子と共に伝送する、

ことを特徴とする請求項 1 記載の移動通信情報伝送方法。

【請求項 4】 処理装置が処理が終わった際に先に通知された移動予定経路とその通知からの経過時間から移動局の位置を予測するに先立ち、交通状況を管理するデータベースへ交通情報を問い合わせ、その交通情報と予定経路から移動局の位置を予測する、

ことを特徴とする請求項 3 記載の移動通信情報伝送方法。

【請求項 5】 処理装置は処理結果を伝送すべき無線基地局へ伝送した後も処理結果を保存し、処理結果を蓄積している無線基地局では、処理結果を蓄積してからの経過時間を計測し、その計測結果が予め定められた時間を経過したときはその蓄積情報を破棄し、破棄した旨を処理装置へ通知し、上記経過時間をリセットし、処理装置はその時間において請求項 1～4 で示す移動局の位置情報により示される無線基地局へ処理結果を伝送する、

ことを特徴とする請求項 1～4 のいずれかひとつに記載の移動通信情報伝送方法。

【請求項 6】 移動局が指定した無線基地局またはその移動局の存在が予測される無線基地局の他にその無線基地局の周辺の無線基地局へも前記処理結果をその移動局の識別子と共に伝送し、

その処理結果と移動局の識別子を受信し蓄積している無線基地局で受信してからの経過時間を測定し、予め定めた一定時間経過してもその移動局がその無線基地局と通信できる圏内に入らずに処理結果を受け取らなかった場合にはその蓄積している処理結果を破棄する、ことを特徴とする請求項 1～5 のいずれかひとつに記載の移動通信情報伝送方法。

【請求項 7】 移動局が処理結果を無線基地局から受信している間にその無線基地局と通信できる圏内から圏外へ移動した場合に、

その旨を処理装置へ通知し、処理装置はその通知を送ってきた無線基地局の周辺の無線基地局へ処理結果を伝送し、

それを受信した無線基地局でその処理結果を蓄積し、移動局は次に圏内に入った無線基地局から再び全処理結果を受信する、

ことを特徴とする請求項 1～6 のいずれかひとつに記載の移動通信情報伝送方法。

【請求項 8】 移動局が処理結果を無線基地局から受信している間にその無線基地局と通信できる圏内から圏外へ移動した場合に、

その旨と処理結果をどこまで伝送したかを処理装置へ通知し、

処理装置はその通知を送ってきた無線基地局の周辺の無

線基地局へ移動局が未受信の処理結果を伝送し、それを受信した無線基地局でその移動局が未受信の処理結果を蓄積し、移動局は次に圏内に入った無線基地局から未受信の部分の処理結果を受信する、ことを特徴とする請求項7に記載の移动通信情報伝送方法。

【請求項9】 移動局が全ての無線基地局の通信可能エリア外であったときにその移動局宛のメッセージを一時的に蓄積しておくメッセージ蓄積データベースをネットワークに接続しておき、処理結果を無線基地局へ伝送するに先立ち、その移動局宛のメッセージをそのメッセージ蓄積データベースから取り出し、処理結果と共にその無線基地局へ伝送し蓄積する、ことを特徴とする請求項1～8のいずれかひとつに記載の移动通信情報伝送方法。

【請求項10】 処理結果を、処理装置から無線基地局へ伝送する区間、及び無線基地局から移動局へ伝送する区間で、情報が誤りなく伝送されることを保証するために誤り検出を行い、誤りが検出された場合には誤りが検出された区間のみで誤ったデータを再送することを特徴とする請求項1～9のいずれかひとつに記載の移动通信情報伝送方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、移动通信において、無線回線が不安定で激しく変化するので、必要なデータを無線回線が安定しているときに短時間で伝送を行うシステムに関する。

【0002】

【従来の技術】これまで、移动通信は移動局の移動に伴い無線回線の状態が激しく変化し、安定な通信が持続できないので、データベースの検索、データを用いた計算、処理など通信を開始してから必要な結果を得られるまでに時間がかかる通信ではその結果を待つまでの間に通信回線が切断されてしまうことがあった。この、不安定な無線回線の欠点を補うために、処理内容の指示を処理装置へ依頼し、一定時間経過後、その結果を処理装置へ移動局から問い合わせたり、処理装置が処理が終わった時点でその移動局を呼び出し、回線を確立して、処理結果をその移動局へ伝送していた。

【0003】しかし、この方法でも、一例として、図12に示すように、処理を依頼する移動局が無線基地局1を介して処理装置へ処理を依頼し、処理装置で処理を行い、処理が終わった後に、移動局が無線基地局2のエリアに入り位置登録、リンク確立（回線確立）、処理結果伝送からリンク開放までの一連の処理を行うと、「移動局と無線基地局2」のリンクを確立した状態で「無線基地局2と処理装置」とのリンクも確立して、しかも、処

理結果をこれらの2リンクに渡り伝送するため、伝送区間が2つになり時間がかかっていた。

【0004】

【発明が解決しようとする課題】移動局と無線基地局との回線が安定していることはほとんどなく、従来技術に示されるような処理中には無線回線を切断して、処理後に再び無線回線を確立する方法が採られてきたが、無線回線を確立した時は安定して通信が行えたとしても、処理装置からデータを伝送している間に無線回線が不安定になってしまうこともあった。また、処理終了後に処理装置から移動局を呼び出しても、移動局が必ずしもある無線基地局の圏内にいるとは限らず、またたとえ圏内にいたとしても処理結果を処理装置から移動局へ伝送する間に無線回線が切断されてしまうことがあるという問題があった。特に、無線基地局がカバーするエリアが連続していない場合に、通信中に移動局が通信可能でないエリアに移動する可能性が高くなるのでこの問題は顕著となる。

【0005】そこで、本発明の目的は、このような移动通信において、処理結果を確実にかつ効率よく移動局へ伝送する方法を提供することにある。

【0006】

【課題を解決するための手段】図1に示すように、受け取りたい処理結果を移動局が移動した先の無線基地局に蓄積しておく。このようにすることで、移動局がその無線基地局と通信が出来るエリアに入ると直ちにその処理結果を受け取ることが出来る。例えば、新幹線で東京駅から新大阪駅へ移動する際に、東京駅発車前に同図左上の無線基地局（AP-1）経由で処理の指示を行い、途中の名古屋に停車したときに、同図左下の無線基地局（AP-2）に蓄積してあった処理結果を受信する。新幹線の路線全てを無線通信可能なエリアとすることは経済的にだけでなく、技術的にも困難である。これは、高速で移動している移動体との通信は通信中の伝搬路の変動が非常に激しいからである。そこで、この例のように、名古屋駅で停車した際に、その停車時間がたとえ短時間であっても処理結果が無線基地局に蓄積してあるので受信することが可能となる。処理結果のデータ量が少なければ、通過時にスピードを落とす途中の小田原駅などへデータを蓄積しておくことも可能である。このほか、車で東名高速を移動している途中のサービスエリアで処理の指示を行い、先のサービスエリアで処理結果を受け取ることも出来る。このように、無線通信の行えるエリアが不連続であっても、ある無線基地局の圏内になるところが短時間でもあれば、必要な処理の指示を与えることでそれに対する処理結果を受け取ることが出来る。

【0007】実際の信号の流れは、図2に示すように、移動中にある基地局AP-1で処理装置へ処理の指示を行う（1）。処理装置は、その依頼に応じて計算を行っ

たり、それにLANが接続されている場合には、そのLAN内のデータベースなどへ必要に応じて検索を行った後、インターネットで接続されているあらゆるデータを検索する(2)/(3)。それらの全ての必要な処理が終了した時点で、その処理結果を先の移動局が移動している、或いは移動する無線基地局AP-2へ伝送し、蓄積しておく(4)。このようにすることで、処理結果を確実に移動局へ伝送することが出来るようになる。

【0008】また、処理結果は一般にデータであるので、伝送誤りが許容されない。そこで、誤り再送制御を行いエラーフリーを補償する。この際に、誤りは無線回線で多く発生し、有線を用いたネットワークではほとんど発生しない。また、伝搬遅延は距離が長い有線区間が支配的となるという特徴がある。このため、誤り再送制御を処理装置と移動局の間で行うと、その両者間の伝搬遅延が長く、かつ無線回線があるため誤りが多くなってしまう。このため、本発明では誤り再送制御を「処理装置と無線基地局」、「無線基地局と移動局」の2区間に分けて行うことにより、効率よい誤り制御が行える。以下に、請求項毎の詳細な課題解決手段を示す。

【0009】移動局が、処理結果を伝送し蓄積しておく無線基地局を指定することで処理装置は処理結果をその指定された無線基地局へ伝送しておき、移動局がその無線基地局のカバーするエリアに入ったときに、直ちにその処理結果を受け取ることが出来る。移動局は処理結果を受け取るときに処理装置までの回線を確立(リンク確立)する必要がないので、短時間に多くのデータ(処理結果)を受信することが出来る。処理に要する時間が明らかであるときに特に有効である(請求項1)。

【0010】また、処理装置で処理が終わった時点で、移動局の位置を、移動管理データベースに問い合わせ、その基地局へ処理結果を伝送し、一時的に蓄積し、直ちにその移動局へデータを伝送することで、処理結果を確実にかつ短時間に移動局へ伝送することができる(請求項2)。ただし、処理装置から無線基地局へ処理結果を伝送する間に移動局がその無線基地局の圏外へ移動してしまうこともあるので、処理装置では、処理結果を無線基地局へ伝送した後、その処理結果を蓄積しておき、その無線基地局が移動局へ処理結果を伝送できなかった場合に、その旨を処理装置へ通知し、処理装置が再び、処理結果を移動局の移動先の無線基地局へ伝送することにより、処理結果の伝送をより確実にする(請求項5)。

【0011】また、移動局が移動する予定を処理装置へ通知することにより、処理装置はその通知された移動予定から、必要な処理が終了した時点で、通信が可能となることが予測される基地局へ処理結果を伝送し蓄積しておくことで、処理装置で処理に必要な時間が不確定であっても、確実に、短時間で処理結果を移動局へ伝送できる(請求項3、4)。

【0012】また、無線基地局のカバーするエリアが不連続の場合には、移動局が長時間に渡り通信が出来ない場合があるので、移動局宛のメッセージを蓄積するメッセージ蓄積データベースへメッセージを蓄積しておき、処理装置が処理結果を無線基地局へ伝送するに先立ち、そのメッセージの有無を確認し、ある場合にはそのメッセージを取り出し、処理結果と共に無線基地局へ伝送する(請求項9)。

【0013】以上のように、処理結果を適当な無線基地局へ、移動局に先回りして伝送しておくことで、処理結果の伝送が無線基地局と移動局との間の回線で行われるので、回線を処理装置まで確立する必要がないので、移動局が不安定な無線回線を確立している時間が大幅に短縮でき、必要な処理結果を確実に受信することが出来るようになる。

【0014】更に、移動局がいるはずの無線基地局へ処理結果を伝送しても、電池が終わってしまったり、電源を切っていたり、或いは他の無線基地局のエリアに位置登録をしていなくとも、その無線基地局の圏外へ移動してしまったりする事を考慮して、無線基地局で不要となった蓄積情報は破棄する(請求項6)。

【0015】また、処理結果の伝送時間は本発明により大幅に短縮できるが、それでも途中で移動に伴い圏外へ出てしまうことがあるので、その際に、それまで移動局が通信を行っていた無線基地局の周辺の無線基地局へ処理結果を伝送することによって、移動局が周辺の1つの基地局の圏内に入り次第直ちに処理結果を受信できるようにする(請求項7、8)。

【0016】

【発明の実施の形態】図3に本発明1の第一実施例を示す。移動局はその時点でいる場所をカバーする無線基地局があることを、無線基地局が送信する制御信号から知る。この制御信号にはそこをカバーする無線基地局の識別子が含まれ、その無線基地局を移動局が識別できる。これは、その移動局が通信を正しく行える無線基地局であるか否かを判定するのに用いる。

【0017】移動局がいる場所をカバーする無線基地局が無線基地局1であることを知った移動局はその無線基地局1へ無線回線を確立し、処理依頼を無線基地局へ移動局の識別子と共に伝送する。更に、無線基地局はその処理依頼を処理装置へ伝送する。処理装置では、その依頼に応じた処理を行い、処理が終了した時点で移動局が処理の指示を行った際に通知した、ある時間に対する場所の情報からなる移動予定から、その時点で移動局がいる、或いはその時点の直後に移動すると予定される無線基地局2への回線を確立し、処理結果を伝送する。処理結果を受け取った無線基地局2は、その処理結果を蓄積しておき、移動局がその無線基地局の圏内に入り、位置登録信号を送信してきたことを移動局の識別子から知り、その位置登録信号を受信後、直ちに無線回線を確立



し、蓄積しておいた処理結果を移動局へ伝送する。こ  
での移動予定は、例えば、移動局が乗る電車など移動予  
定の確率が高い場合に特に有効となる。処理が終わった  
時点で次にその電車が停車する駅等の無線基地局へ処理  
結果を伝送しておくことで、停車時は通信が安定するの  
で移動局は処理結果を確実に受信できる。

【0018】図4に本発明2の第一実施例を示す。移動  
局がいる場所をカバーする無線基地局1へ無線回線を確  
立し、処理依頼を無線基地局へ伝送する。更に、無線基  
地局はその処理依頼を処理装置へ伝送する。処理装置で  
は、その依頼に応じた処理を行い、処理が終了した時点  
で移動管理データベースへ登録されている移動局の位置  
情報を問い合わせ、その位置情報に示される無線基地局  
3へ回線を確立し、処理結果を伝送する。処理結果を受  
け取った基地局は、直ちに移動局を呼び出し、処理結果  
を移動局へ伝送する。この例では移動局は無線基地局  
2の圏内に一度はいるが、その圏内にいる間に処理が終  
わらないので、そこでは処理結果を受け取れない。その  
後、無線基地局3の圏内にいる間に処理が終わり処理結  
果を受信できている。

【0019】図5に本発明3の第一実施例を示す。移動  
局がいる場所をカバーする無線基地局1へ無線回線を確  
立し、処理依頼と移動予定として、徒歩、自動車、電車  
等の移動の手段及び道順、電車であればその路線を移動  
予定経路としてこれらの情報を無線基地局1へ伝送す  
る。更に、無線基地局1はその処理依頼と移動予定を処  
理装置へ伝送する。処理装置では、その依頼に応じた処  
理を行い、処理が終了した時点で、移動局から通知され  
た移動予定から、その処理が終わった時間に移動局がい  
る、或いは移動局がまもなく移動することが予定されて  
いる無線基地局2へ処理結果を伝送する。無線基地局2  
は、移動局から位置登録の信号が送られてきたら直ち  
に、回線を確立し、処理結果を移動局へ伝送する。

【0020】図6に本発明4及び9の第一実施例を示  
す。移動局がいる場所をカバーする無線基地局1へ無線  
回線を確立し、処理依頼と移動予定を無線基地局へ伝送  
する。更に、無線基地局1はその処理依頼と移動予定を  
処理装置へ伝送する。処理装置では、その依頼に応じた  
処理を行い、処理が終了した時点で、移動局から通知さ  
れた移動予定を交通情報から修正して、その時点で移動  
局がいる、或いは移動局がまもなく移動することが予測  
されている無線基地局2へ処理結果を伝送する。この予  
測は移動管理データベースによって行われる。移動管理  
データベースは、移動局から通知された移動予定をもと  
に、処理装置から、移動局の位置の問い合わせがあった  
時点の位置を、移動局が用いる交通手段に関する交通情  
報を用いて予測する。この交通情報は、移動局が車によ  
る移動の場合には道路交通情報を用い、鉄道による場合  
には、鉄道の運行状況をもとに移動位置を予測する。無  
線基地局2は、移動局から位置登録の信号が送られてき

たら直ちに、回線を確立し、処理結果を移動局へ伝送す  
る。

【0021】また、移動局が無線基地局と通信できるエ  
リア外（圏外）にいる場合に、他者からのメッセージを  
蓄積しておくことにより、他者との通信を仲介すること  
ができ、通信の利便性の向上が図れる。この機能を実現  
するのが、同図中のメッセージ蓄積データベースであ  
る。移動局と通信を行いたい、移動局が圏外であるた  
めに通信が出来ない状態であればこのメッセージ蓄積デ  
ータベースへメッセージを残す。処理結果を処理装置か  
ら無線基地局2へ伝送するのに先立ち、メッセージ蓄積  
データベースへ、その移動局宛のメッセージの有無を確  
認して、ある場合には処理結果と共に伝送する。

【0022】図7に本発明5の第一実施例を示す。処理  
が終了し、その時点での移動局の位置を移動管理デー  
タベースへ問い合わせ、予測された無線基地局2へその処  
理結果を送り、それを蓄積している無線基地局2で、移  
動予定が変わった等の理由でこの予測が正しく行われな  
かったため、無線基地局2で蓄積を開始してから、ある  
一定時間経過しても、該当する移動局がその無線基地局  
2の圏内へ入らず、処理結果を移動局へ伝送できない場  
合には、その無線基地局2で蓄積している処理結果を廃  
棄すると共に、その旨を無線基地局2から処理装置へ通  
知し、処理装置は再び該当移動局がいる位置を移動管理  
データベースへ問い合わせし直して、その無線基地局3  
へ処理結果を伝送する。処理装置では、無線基地局3へ  
処理結果を伝送した後、予め定めた時間内に、無線基地  
局3から処理結果廃棄通知が無ければ、蓄積しておいた  
処理結果が移動局へ伝送されたとみなし、処理結果を廃  
棄する。これにより、処理装置での無駄な蓄積を避ける  
ことが出来る。

【0023】図8に本発明6の第一実施例を示す。処理  
が終了し、その時刻に移動局がいると考えられる無線基  
地局1～3へ処理結果を伝送する。ここで、無線基地局  
1は移動局から通知された移動予定から移動局がその時  
点でいると予測される基地局、無線基地局2及び3は無  
線基地局1に接する或いは隣接する無線基地局である。  
それぞれの無線基地局では、その受信した処理結果を蓄  
積し、蓄積時間を計測する。蓄積時間が一定時間を経過  
した場合には蓄積している処理結果を破棄する。この実  
施例では、移動局が無線基地局2の圏内に入り、無線基  
地局2から処理結果を受信している。他の無線基地局1  
及び3は、タイマーで計測している時間が満了すると蓄  
積処理結果を破棄する。また、無線基地局2では、移動  
局に処理結果を伝送した後に処理結果を破棄する。この  
ように移動局が指定或いは処理装置へ通知した移動予定  
が多少変わっても、周辺の無線基地局からでも処理結果  
を受け取ることが出来る。

【0024】図9に本発明7の第一実施例を示す。処理  
が終了し、その時刻に移動局がいると考えられる無線基

地局1へ処理結果を伝送する。無線基地局1では、受信した処理結果を蓄積する。この実施例では、移動局が無線基地局1の圏内に入り、無線基地局1から処理結果を受信している。処理結果を伝送している途中で無線基地局1の圏外へ移動してしまったため、伝送が完了していないので無線基地局1は処理装置へ、伝送完了の旨通知する。処理装置では、その通知を受けて、他の無線基地局2を移動局が移動すると予測し、無線基地局2へ処理結果を伝送する。移動局は無線基地局2の圏内に入り処理結果を受け取る。ここでは、先に受け取った処理結果の一部は全て破棄し、最初から処理結果を受信し直すので、伝送状況の管理が、「完了」と「完了」の2状態だけになるので処理装置と移動局での処理結果の管理が簡単になる。

【0025】図10に本発明8の第一実施例を示す。処理が終了し、その時刻に移動局がいると考えられる無線基地局1へ処理結果を伝送する。無線基地局1では、受信した処理結果を蓄積する。この実施例では、移動局が無線基地局1の圏内に入り、無線基地局2から処理結果を受信している。処理結果を伝送している途中で移動局が無線基地局1の圏外へ移動してしまったため、伝送が完了していない。そこで、無線基地局1は処理装置へ、処理結果の伝送がどこまで完了したかを通知する。処理装置では、その通知を受けて、移動予定から無線基地局2のエリアへ移動局が移動すると予測し、移動局への伝送が未完了の部分の処理結果を無線基地局2へ伝送する。移動局は無線基地局2の圏内に入り処理結果を受け取る。ここでは、先に受け取った処理結果はそのまま記憶しておくので、それを再送する必要がなく、短時間で残りの処理結果を伝送することが出来る。この実施例では無線基地局1の周辺の無線基地局は無線基地局2だけの例であるが、複数ある場合にはそれら全ての無線基地局へ伝送未完了の部分の処理結果を伝送し、移動局がそれらの無線基地局のいずれかの圏内に入れば残りの処理結果を受信できる。

【0026】図11に、本発明の効果を確認するための計算結果を示す。ここでは、無線回線の接続時間が長い

ほど、その回線を保持する確率が指数関数で低減し、位置登録、リンク確立などの制御にそれぞれ、0.1秒かかるかと仮定して、従来技術と本発明での処理結果伝送時間の差により変わる、処理結果伝送の完了率の比を算出した。処理結果の伝送時間が短いほど本発明の効果が大きい、処理結果伝送に20秒かかっても完了率が37%程度改善されていることが分かる。

【0027】尚、ここでの評価では処理結果の伝送時間は有線ネットワークと無線回線とで同じと仮定した。

10 【0028】

【発明の効果】以上に説明したように、移動無線通信を行うシステムにおいて時間のかかる処理を処理装置に依頼し、処理が終わった時点で再び移動局と処理装置との間で回線を確立して処理結果を移動局が得るシステムに本発明を適用することで、従来技術に比して、短い無線回線の接続時間で必要な処理結果を受け取ることが出来るので、効率よく確実に目的の結果を得られる。また、同時に誤り制御（再送制御）も効率よく行える。

【図面の簡単な説明】

20 【図1】本発明の背景と、基本的なアイデアを説明する図である。

【図2】本発明での信号の流れを説明する図でAP-1は処理の指示をするときに移動局が属している基地局、AP-2は処理結果を受け取るときに移動局が属している基地局である。

【図3】本発明1の第一実施例である。

【図4】本発明2の第一実施例である。

【図5】本発明3の第一実施例である。

【図6】本発明4及び6の第一実施例である。

30 【図7】本発明5の第一実施例である。

【図8】本発明7の第一実施例である。

【図9】本発明8の第一実施例である。

【図10】本発明9の第一実施例である。

【図11】本発明の効果を説明する図である。

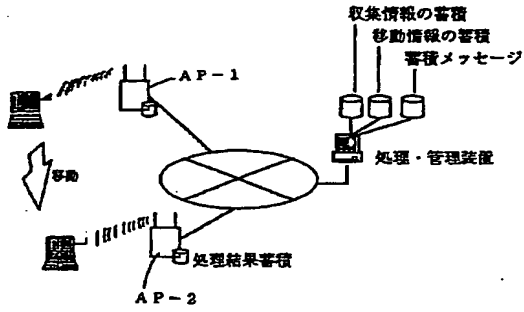
【図12】従来技術を説明する図である。

【符号の説明】

AP-1、AP-2 無線基地局

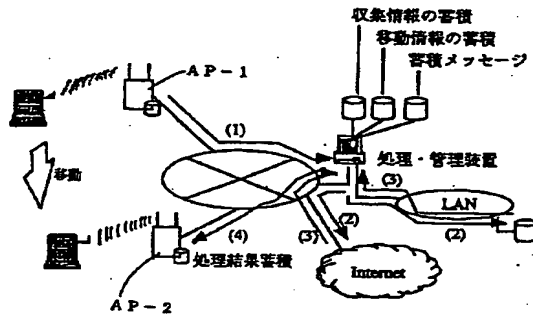
【図1】

本発明の概要



【図2】

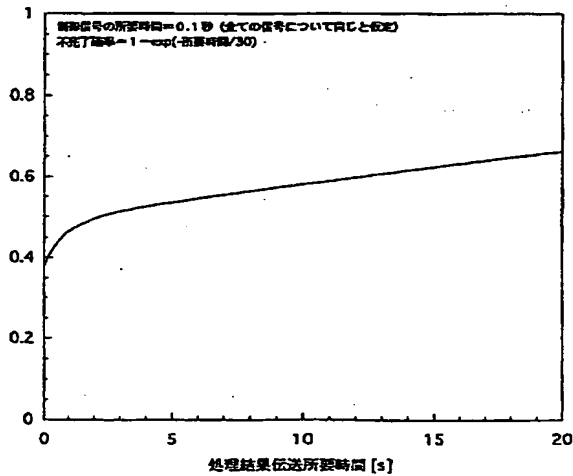
信号の流れ



【図11】

本発明の効果を示す図

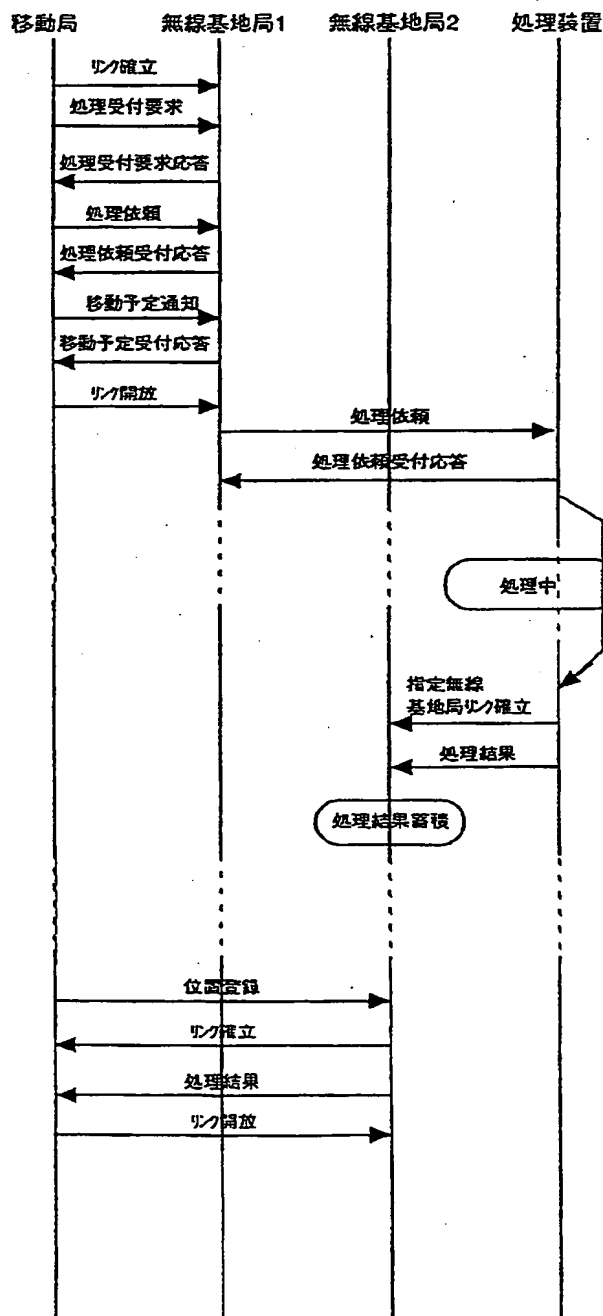
(本発明による処理結果伝送完了率)  
 / (従来技術による処理結果伝送完了率)



完了率の減少

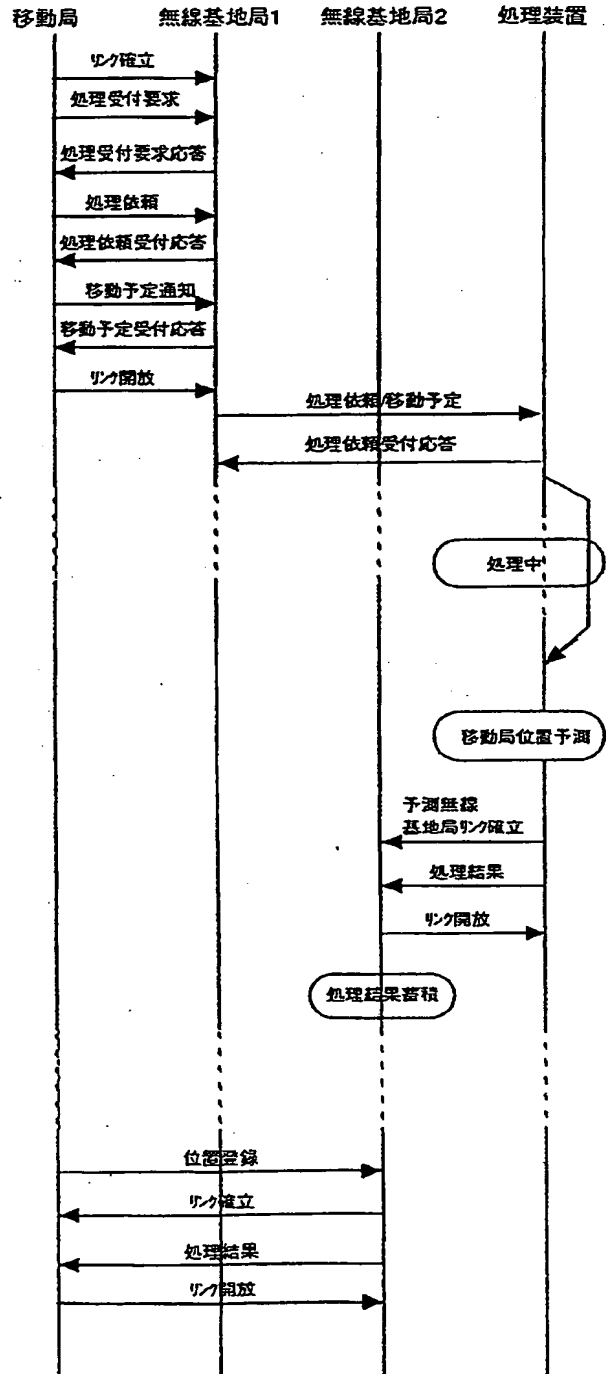
【図3】

## 本発明1の第一実施例



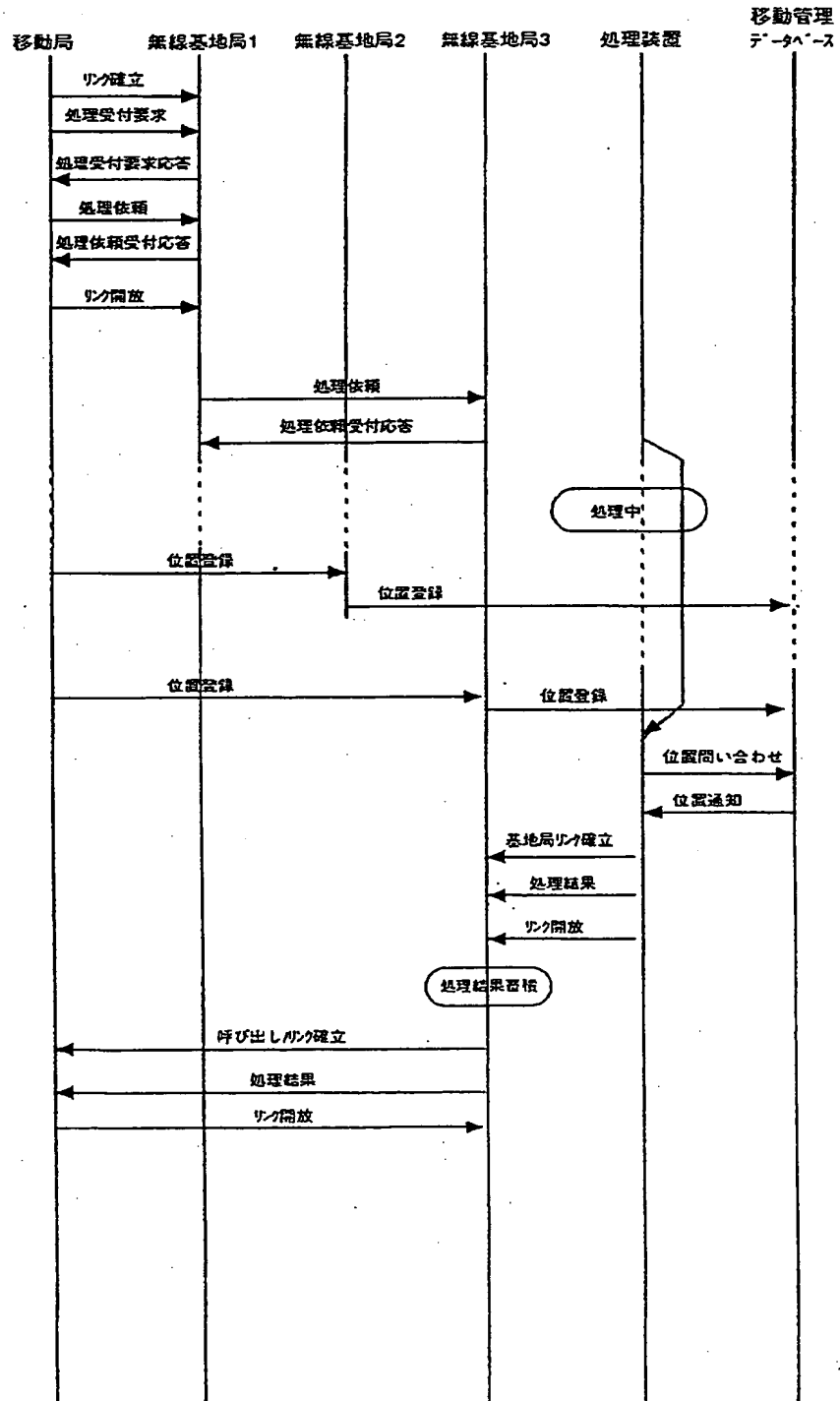
【図5】

## 本発明3の第一実施例



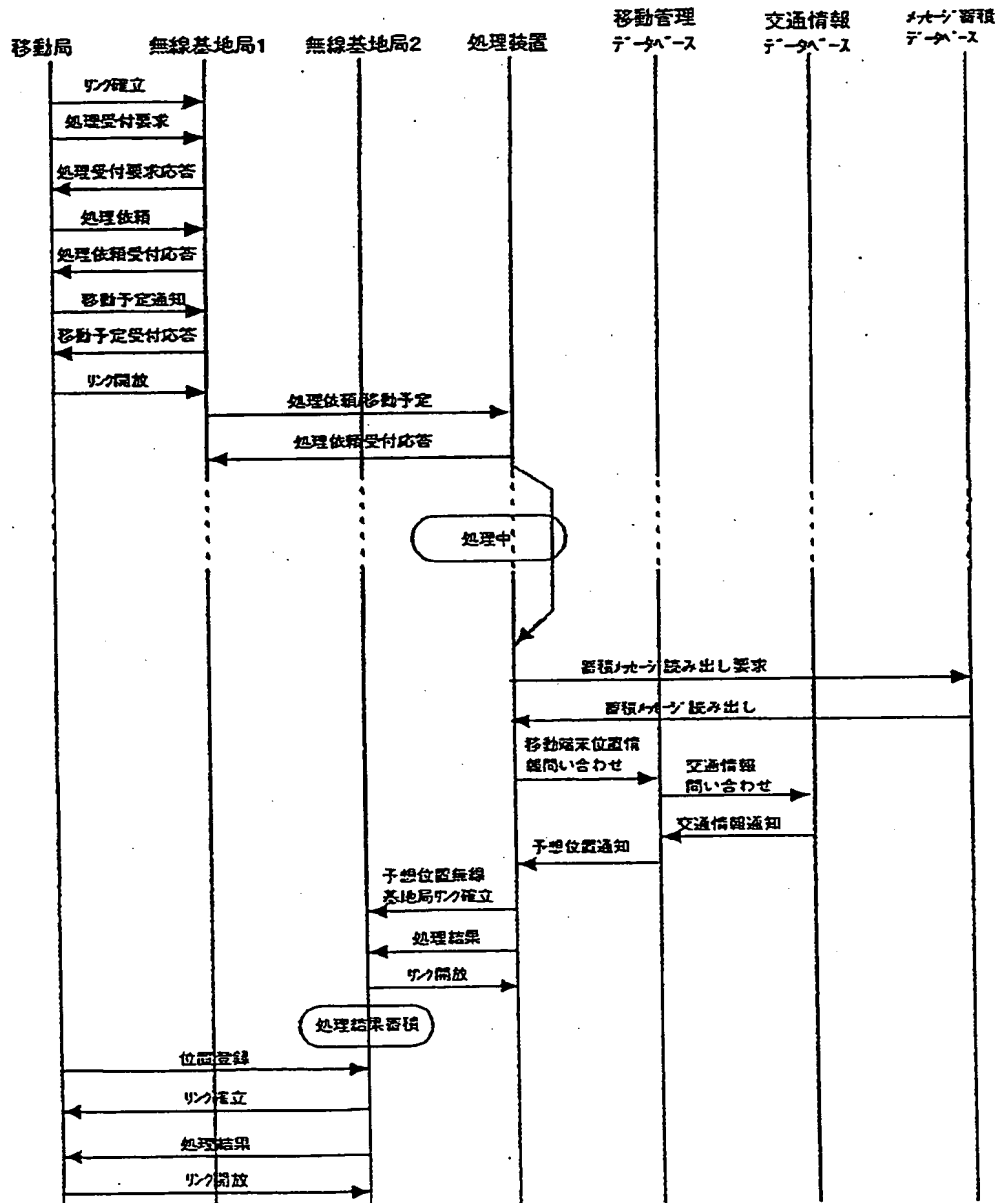
【図4】

## 本発明2の第一実施例



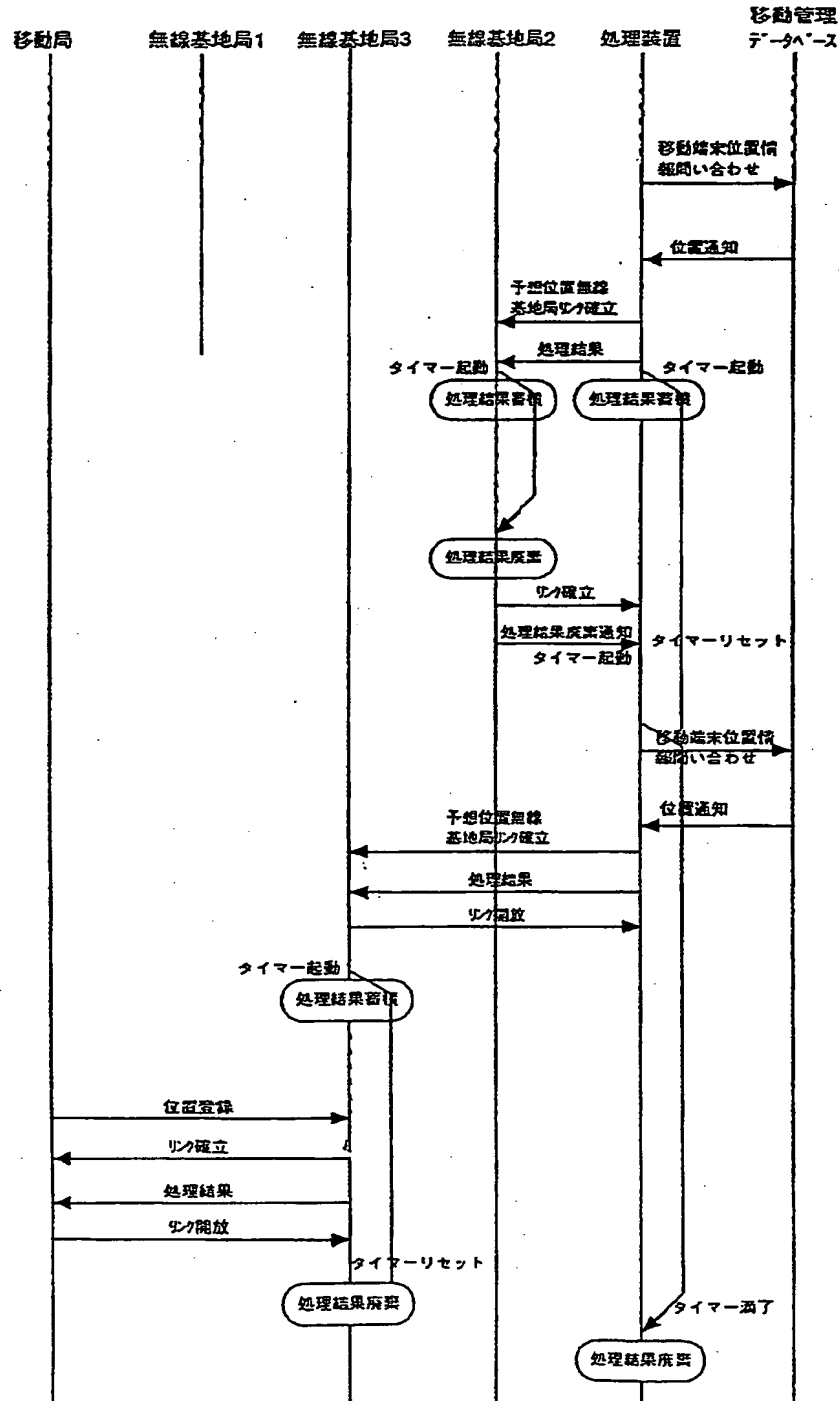
【図6】

## 本発明4及び9の第一実施例

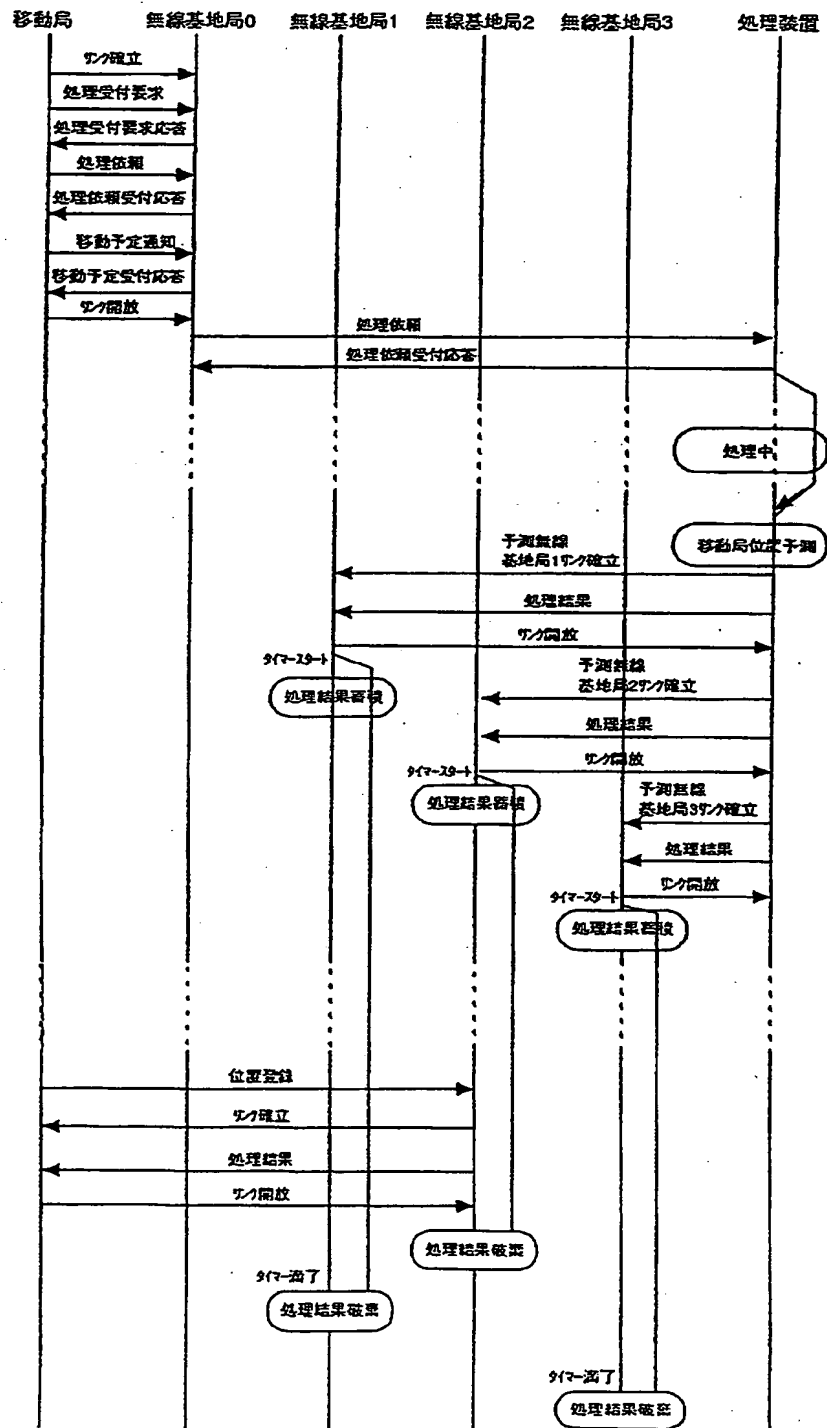


【図7】

## 本発明5の第一実施例



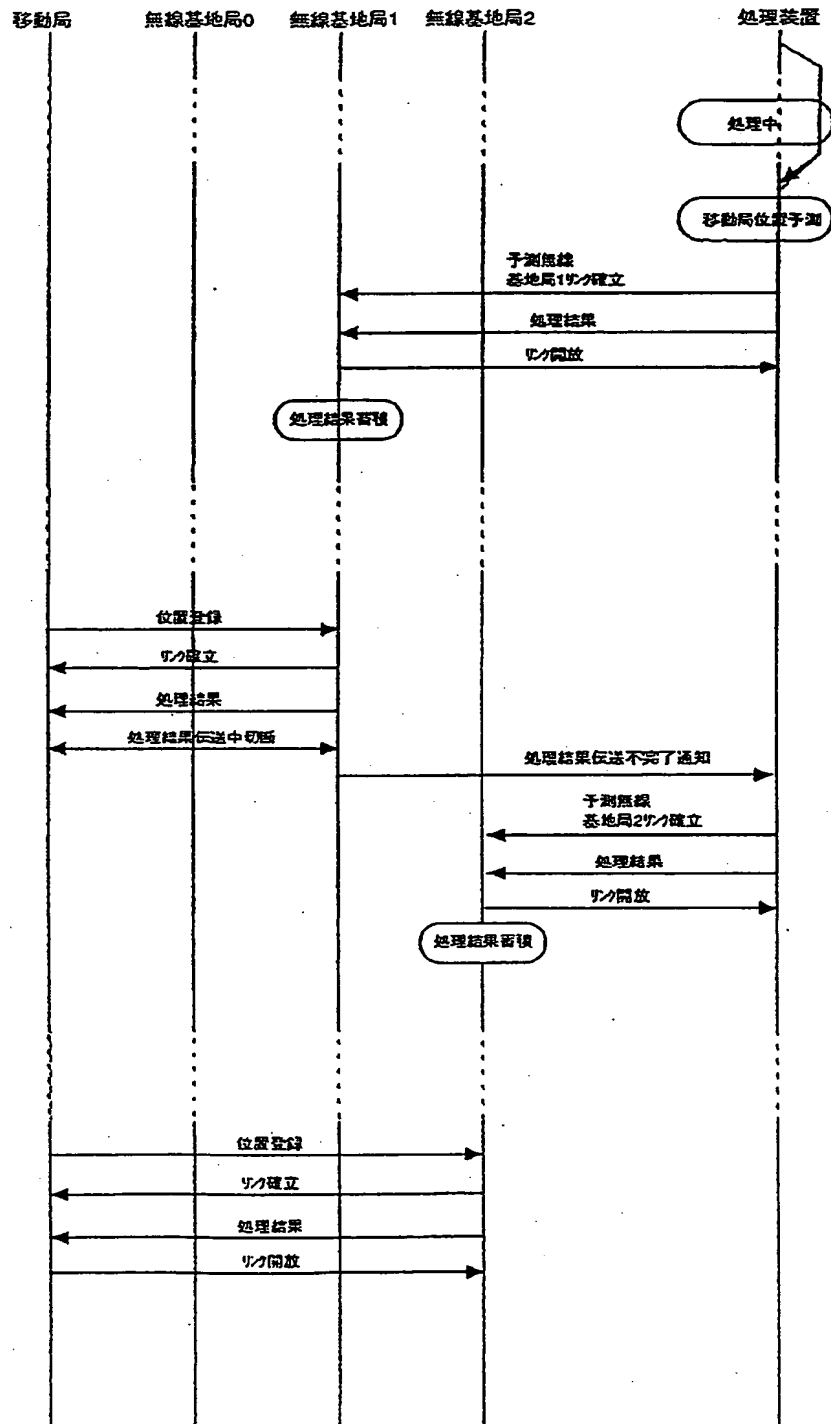
### 本発明 6 の第一実施例





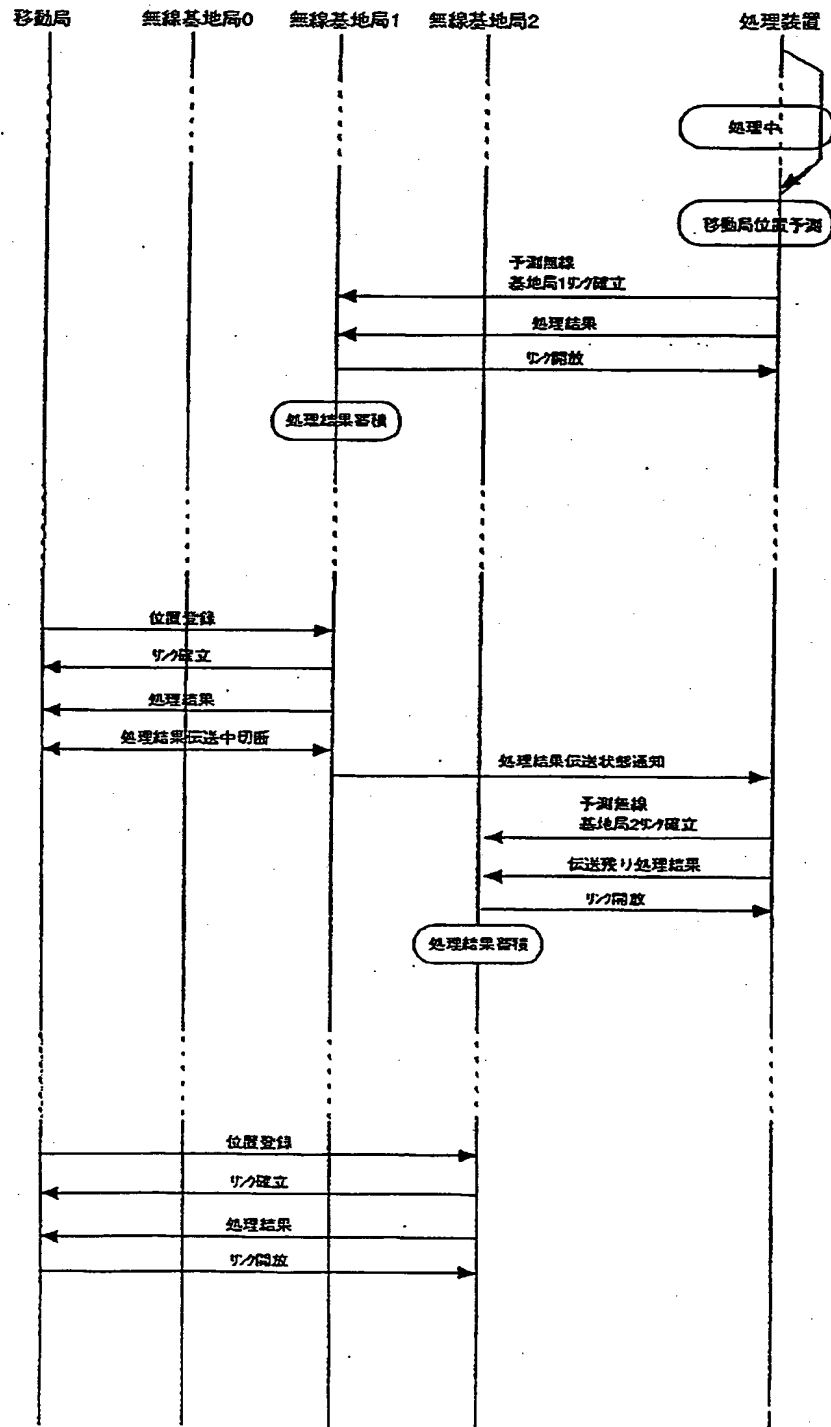
【図9】

## 本発明7の第一実施例



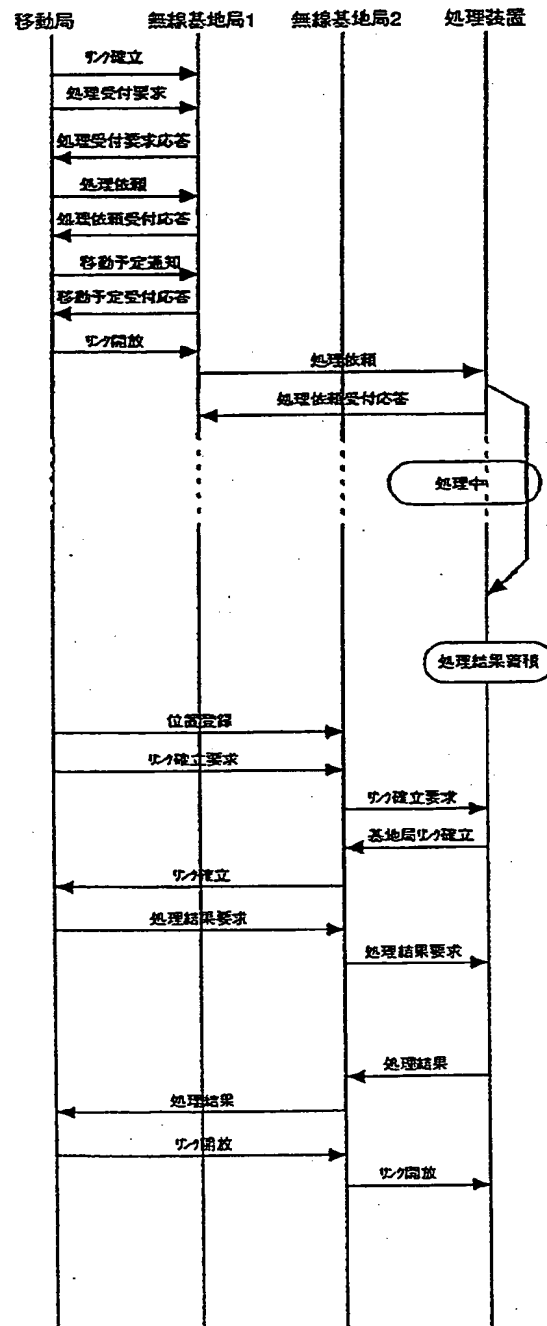
【図10】

## 本発明8の第一実施例



【図12】

従来の技術を説明するフロー



フロントページの続き

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